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FIRST-YEAR ALGEBRA, AS DEVELOPED IN THE ACADEMIC HIGH SCHOOL, NEW BRITAIN, CONN.

By Robert R. Goff.

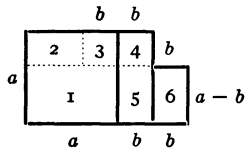
The aim of first-year algebra is to develop: (1) Ability to translate problems into equations of the first and second degree, and to solve these equations; (2) habits of systematic effort. For this purpose a study of the following topics is necessary:

1. The four operations, with much drill on signs, coefficients, and exponents.
2. Special products, with emphasis on the square of a binominal.
3. Factoring without grouping. Three cases:
   (1) Common monomial factor.
   (2) Quadratic trinomial.
   (3) Difference of two squares.
4. Fractions, principally with monomial denominators.
5. Linear equations.
6. Square root of arithmetical numbers.
7. Quadratic equations, solved by:
   (1) Graphs.
   (2) Factoring.
   (3) Completing the square.
8. Simultaneous linear equations, solved by addition or subtraction, and graphs.
9. Simultaneous linear-quadratic equations, solved by substitution, and graphs.
10. Problems,—ten types.

All of these topics are illustrated by geometrical figures. For example:

Factor $a^2 + ab - 2b^2$

Algebra	Geometry
$a^2 + ab - 2b^2 = (a + 2b)(a - b)$	Let $a =$ ——; $b =$ —



What figure represents a^2? ab? $2b^2$? $a^2 + ab - 2b^2$?
What does figure $2 = ?$ (6)
By rearranging, what rectangle is formed? $(1 + 5 + 6)$.
The sides of this rectangle are the factors.

The commoner definitions are shown by contrast.

Sum is the result of adding quantities.	*Product* is the result of multiplying quantities.
Term is one of the quantities of a sum.	*Factor* is one of the quantities of a product.
Coefficient shows how many times the quantity is used as a term.	*Exponent* shows how many times the quantity is used as a factor.
Multiple is the sum of identically equal terms.	*Power* is the product of identically equal factors.
Aliquot part is one of the identically equal terms of a multiple.	*Root* is one of the identically equal factors of a power.
Denominator shows how many equal aliquot parts.	*Index* shows how many equal roots.

The ten types of problems with their formulas are:

1. Equality of abstract related numbers.	$A +, -, \times, \div x = b +, -, \times, \div y.$
2. Cost, selling price, gain or loss.	$C + G = S$; $C - L = S.$
3. Mensuration (rectangles, etc.).	(a) $p = 2l + 2w.$
	(b) $a = lw.$
4. Number with digits.	$100h + 10t + u = n.$
5. Value of coins.	$25q + 10d + c = s.$
6. Changed number and price.	$np = (n + a)(p + b)$
7. Joint work.	(a) $1/a + 1/b = 1/c.$
	(b) $x/a + y/b = 1.$
8. Interest.	(a) $I = PRT/100.$
	(b) $A = P + PRT/100$
9. Mixtures.	(a) $ax + by = c(x + y).$
	(b) $am = c(m + y).$
10. Uniform motion.	$D = RT.$

Under class 6 are the lever problems where p is the power and n is the distance from the fulcrum.

In class 7, formula (a) is used when all the elements work all the time; formula (b) when some of the elements do not work

all the time. Under this case are the problems about the consuming of provisions by a number of men; also the filling of tanks by pipes.

In class 9, there are two common kinds of mixture problems:

(*a*) By taking from an *a* per cent. mixture and a *b* per cent. mixture to make a *c* per cent. mixture.

(*b*) By dilution, to change the per cent. of an ingredient in a mixture from *a* to *b*.

The second is a special case of the first when *b* equals zero.

Alloy problems come under class 9.

In class 10, uniform motion problems are of many types. Some of these are:

1. Two objects moving in the same direction for the same distance but unequal rates and times.

2. Two objects moving in opposite directions for the same time but unequal rates and distances.

3. An object moving with and against an outside force.

Rotating wheel problems often come under the first type; clock problems under the second.

The recitation is divided roughly into three parts:

1. Drill in analysis, recognition of types, and determination of method on past work; sometimes "chalk and talk."

2. Drill of a similar nature in the assignment for the next day.

3. Supervised study, with individual attention that the drill is followed.

NEW BRITAIN, CONN.